
# HOW BOAT SEWAGE DISCHARGES AFFECT THE ENVIRONMENT

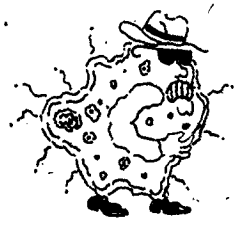
The San Francisco Bay-Delta Estuary is a sports lover's paradise. Whether as boaters, swimmers, windsurfers, sailors, anglers or sailboarders, we all delight in its sparkling blue-green waters and miles of open shoreline. But pollution — from many sources — threatens the Estuary environment. Human sewage from recreational boats is one pollution source that can impair the Estuary's water quality, harm its fish and wildlife and spoil our recreational activities.

## ARE SEWAGE DISCHARGES FROM BOATERS REALLY A PROBLEM?

Yes, they can be. Recreational boaters contribute to the overall pollution problem when they dump raw or poorly treated sewage into our waterways. Scientists use fecal coliform bacteria counts to measure sewage pollution, and studies have found high levels of coliform bacteria in areas with heavy concentrations of recreational boats. Studies have also shown a direct relationship between the number of boats in a sampled area and increased coliform levels in both the water column and shellfish.

## HOW HARMFUL ARE VESSEL DISCHARGES?

If a single vessel discharges wastes in the open ocean outside the three-mile limit, there is little health risk to humans. But if many vessels dump wastes overboard in confined areas — like harbors, marinas, coves, inlets or sloughs — it can create a problem. The untreated discharge from one weekend boater puts the same amount of bacterial pollution into the water as does the treated sewage of 10,000 people.



Human wastes can contain disease-causing organisms such as bacteria, viruses and parasites. Swimmers, waterskiers and others who swallow or come in contact with water that has been contaminated with human wastes can become ill. People who eat raw or poorly cooked clams, mussels or oysters from contaminated shellfish beds also risk getting sick.

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## VESSEL WASTES AND PEOPLE — WHAT'S THE EFFECT?

Raw or poorly treated sewage can:

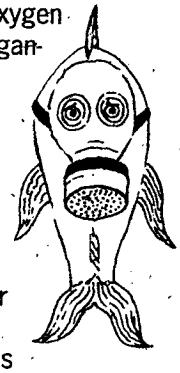
- Spread disease
- Contribute unsightly floatables
- Contaminate shellfish beds
- Lower oxygen levels in water

**Sewage-polluted water can be hazardous to your health.** Studies of swimmers, scuba divers and windsurfers have shown measurable health effects associated with exposure to sewage-polluted waters. The most common symptoms are nausea, stomachache, vomiting and diarrhea. Other symptoms include sore throat, cough, runny nose, earache and other respiratory problems. Contact with polluted water can also cause skin infections and rashes. More serious water-borne diseases include infectious hepatitis, typhoid and cholera.

**The sight of floating sewage is unappealing.** It takes away from our enjoyment of time on the water.

**Untreated vessel discharges can contaminate shellfish beds.** When boaters dump human waste overboard at a shellfish bed, the sewage reaches the bottom where it is taken up by bottom-dwelling clams, oysters or mussels. These filter feeders eat bacteria from sewage along with the tiny particles of food they pump through their gills into their stomachs. Shellfish can convey virtually all water-borne pathogens (disease-causing organisms) to humans. When people eat raw or partially cooked contaminated shellfish, they may become ill.

**Sewage can decrease the amount of oxygen available in water.** Oxygen reduction threatens aquatic organisms, which depend on dissolved oxygen to live. It takes oxygen to decompose sewage in the water, which in turn reduces the amount of dissolved oxygen available to aquatic organisms. "Biological Oxygen Demand" (BOD) measures the amount of dissolved oxygen needed to decompose organic matter — like human sewage — in the water by aerobic processes. High BOD is often found in marinas and poorly flushed waters where boaters congregate. Although the volume of wastes from recreational boaters is small, the organics in this wastewater are concentrated and will increase BOD in the vicinity of the boats. The result can be stagnant water and fish kills.



## HOW IS SEWAGE POLLUTION MEASURED?

Health officials use indicator organisms to test water quality and determine whether a health hazard exists. The indicators used to detect sewage pollution are fecal coliform bacteria, which are produced in the intestines of all warm-blooded animals. Water samples are collected and measured for coliform counts.

The test results are usually expressed as the number of bacteria per 100 milliliters (ml) of water. Coast Guard

regulations set water quality specifications for wastes discharged from boaters' Marine Sanitation Devices (MSDs). For example, a maximum fecal coliform count of 1,000 per 100 ml is allowed for wastes discharged from Type I MSDs; fewer for Type II MSDs. Type III MSDs should only be emptied at an onshore pumpout station, with a portable pumpout unit or by a commercial service unless you are operating outside the three-mile limit in the open ocean.

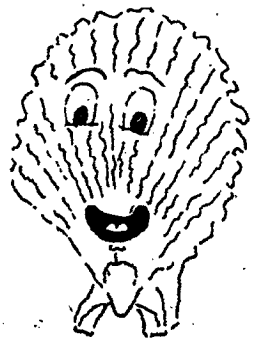
Some studies have found a significant increase in gastrointestinal illness for swimmers over nonswimmers at 1,000 fecal coliforms per 100 ml — the amount allowed with a Type I MSD. A fecal coliform count of 14 per 100 ml closes commercial shellfish beds, and a count of 200 fecal coliform bacteria per 100 ml of water will close public beaches to swimming.

Some scientists say measuring fecal coliform bacteria may not be the best way to determine whether shellfish beds and swimming areas are safe for humans. Although coliform bacteria counts can indicate contamination from human and animal wastes, they do not show whether pathogens — disease-causing microorganisms like viruses — are present.

## HOW ARE PATHOGENS REMOVED FROM THE WATER?

Pathogens can be removed from the water by dilution, dispersal, die-off or attachment to sediments. A water body's flushing action and volume determine how quickly organisms are dispersed. Wind, freshwater inflow and tidal action all speed dispersal. Pathogen survival is shortest in warm summer temperatures. Most viruses are inactivated in one hour in 55 - 65 degree water; but a number of factors — salinity, sunlight, predation and microbial toxins — can affect this timing. Fecal coliform and other microorganisms have a shorter survival time in seawater.

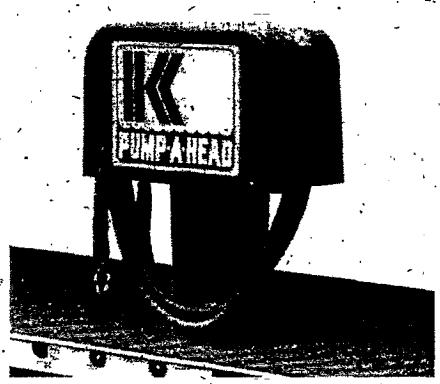
Bacteria and viruses tend to attach to particles, sink to the bottom and remain in sediments longer than in the water column. This increased survival time can affect the quality of shellfish that feed on sediment particles. Contaminated sediments can be resuspended when marinas or shallow areas are dredged.



## KEEPING OUR WATERWAYS CLEAN

As a group, boaters are dedicated to protecting the marine environment. Boaters know firsthand the joys of life on the water — the fresh, biting winds; the exhilarating action; the sunlit waves and the timeless serenity. Keeping raw sewage out of our waterways and disposing of it properly will help preserve these pleasures and keep our waters clean and healthy.

*This pamphlet was produced by the San Francisco Estuary Project in cooperation with the California Department of Boating and Waterways under a grant from the Clean Vessel Act. The San Francisco Estuary Project is a cooperative federal/state program whose primary goal is to restore and protect water quality and natural resources while promoting effective management of the Bay and Delta. The Estuary Project has developed and published a variety of boater education materials, pumpout maps, technical reports, information sheets, pollution prevention guides and other materials that are available free or for a nominal charge by calling (510)286-0460.*




*Typical Dockside Pump*

## GLOSSARY

**Bacteria:** Typically one-celled microorganisms that have no chlorophyll, multiply by simple division and can be seen only with a microscope

**BOD:** Biological Oxygen Demand. The amount of oxygen, expressed in milligrams per liter, that bacteria take from water to oxidize organic matter into carbon dioxide

**Fecal coliform bacteria count:** A measure used to indicate fecal contamination of water supplies

**MSD:** Marine Sanitation Device. Any equipment for installation on board a vessel that is designed to receive, retain, treat or discharge sewage; and any process to treat such sewage

**Pathogen:** Any microorganism or virus that can cause disease

**Shellfish:** A bivalve such as a clam, oyster or mussel

**Virus:** Any of a group of ultramicroscopic or submicroscopic infective agents that cause various diseases in animals or plants

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